

Notice of Allowability

Application No.

09/912,844

Examiner

Ram N Kackar

Applicant(s)

BIBERGER ET AL.

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 2/27/2004.
2. ☒ The allowed claim(s) is/are 1-5, 7-13, 15-17 and 19-22.
3. ☒ The drawings filed on 24 July 2001 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date 12/5/03
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Tom Haverstock on April 16, 2004.

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

Claim 1 (currently amended): A high pressure chamber for processing of a semiconductor substrate comprising:

- a. a chamber housing comprising a first sealing surface;
- b. a spacer containing a plurality of injection nozzles, the spacer sealing to the first sealing surface;
- [[b]]c. a platen comprising a region for holding the semiconductor substrate and a second sealing surface; and
- [[c]]d. a single mechanical drive mechanism having a single pressure source ~~for forming and maintaining a wafer cavity for containing the semiconductor substrate during high pressure processing,~~ the single mechanical drive mechanism coupling the platen to the chamber housing such that in operation the single mechanical drive mechanism separates the [[platen]] second sealing surface from the ~~chamber housing~~ spacer for loading of the semiconductor substrate and further such that in

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operation the said single mechanical drive mechanism causes the second sealing surface of the platen to seal to and the first sealing surface of the chamber housing to contact, the spacer, such that the spacer, the first sealing surface, and the second sealing surface form and maintain thus forming the a wafer cavity containing the region for holding the semiconductor substrate and maintaining the wafer cavity during high pressure processing; and

- d. ~~a circulation loop coupled to the wafer cavity and configured to maintain a supercritical fluid and circulate the supercritical fluid through the wafer cavity.~~

Claim 6 (canceled)

Claim 13 (currently amended): A high pressure chamber for processing a semiconductor substrate comprising:

- a. a chamber housing comprising a first sealing surface;
- b. a spacer containing a plurality of injection nozzles, the spacer configured to seal to the first sealing surface;
- ~~[[b]]~~c. a platen comprising a second sealing surface and a region for holding the semiconductor substrate;
- ~~[[c]]~~d. a single mechanical drive mechanism having a single pressure source ~~for forming a wafer cavity for containing the semiconductor substrate~~, the single mechanical drive mechanism coupling the platen to the chamber housing such that in operation the single mechanical drive mechanism separates the ~~[[platen]]~~ second sealing surface from the ~~chamber housing spacer~~ for loading the semiconductor substrate and further such that in operation the said single mechanical drive mechanism causes the second sealing surface of the platen to seal to the spacer and the first sealing surface of the chamber housing to contact, such that the spacer, the first sealing surface, and the second sealing surface thus forming the form a wafer cavity containing the region for holding the semiconductor substrate; and
- ~~[[d]]~~e. ~~a mechanical clamp coupled to the chamber housing and the platen such that in operation the mechanical clamp maintains the wafer cavity during high pressure processing; and~~
- e. ~~a circulation loop coupled to the wafer cavity and configured to maintain a supercritical fluid and circulate the supercritical fluid through the wafer cavity.~~

Claim 14 (canceled):

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Claim 15 (currently amended): An apparatus for high pressure processing of a semiconductor substrate comprising:

- a. a pressure chamber frame;
- b. a single piston coupled to the pressure chamber frame and comprising a piston body and a piston neck, the pressure chamber frame and the piston body forming a first fluid cavity;
- c. a sealing plate coupled to the pressure chamber frame, the sealing plate in conjunction with the pressure chamber frame, the piston body, and the piston neck forming a second fluid cavity;
- d. a platen coupled to the piston neck, the platen comprising a region for holding the semiconductor substrate and a first sealing surface;
- e. a spacer having a plurality of injection nozzles configured to couple to a supply source; and
- [[e]]f. a top lid coupled to the pressure chamber frame and comprising a second sealing surface, the second sealing surface sealing to the spacer, the first sealing surface of the platen and the ~~second sealing surface of the top lid~~ spacer configured such that in operation the said piston body can be moved using a single pressure within the first fluid cavity so that the first ~~and second~~ sealing surfaces surface seals to the spacer ~~contact~~ to form a wafer cavity and to maintain the wafer cavity during high pressure processing, and in further operation the piston body can be moved so that the first ~~and second~~ sealing surfaces surface is separated from the spacer ~~do not contact~~, thereby allowing the semiconductor substrate to be loaded into and unloaded from the pressure chamber frame, ~~and~~
- f. ~~a circulation loop coupled to the wafer cavity and configured to maintain a supercritical fluid and circulate the supercritical fluid through the wafer cavity.~~

Claim 18 (canceled)

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Claim 19 (currently amended): The high pressure chamber of claim [[18]] 1, wherein the spacer further contains a plenum coupled to the plurality of injection nozzles, the plenum having a width larger than a width of the plurality of injection nozzles.

Claim 21 (currently amended): The high pressure processing chamber of claim 19, further comprising a supercritical condition generator coupled to the plenum, the supercritical condition generator comprising a heater coupled to a ~~fluid~~ supply source, the supply source comprising a supply vessel.

Claim 22 (currently amended): The high pressure chamber of claim 1, further comprising a circulation loop coupled to the wafer cavity and configured to maintain a supercritical fluid in a supercritical state and to circulate the supercritical fluid through the wafer cavity wherein the high pressure processing chamber ~~of claim 1~~, further comprising a pump and a filter coupled to the circulation loop.

CLEAN COPY OF FINAL CLAIMS

Claim 1 (currently amended): A high pressure chamber for processing of a semiconductor substrate comprising:

- a. a chamber housing comprising a first sealing surface;
- b. a spacer containing a plurality of injection nozzles, the spacer sealing to the first sealing surface;
- c. a platen comprising a region for holding the semiconductor substrate and a second sealing surface; and
- d. a single mechanical drive mechanism having a single pressure source, the single mechanical drive mechanism coupling the platen to the chamber housing such

that in operation the single mechanical drive mechanism separates the second sealing surface from the spacer for loading of the semiconductor substrate and further such that in operation the said single mechanical drive mechanism causes the second sealing surface of the platen to seal to the spacer, such that the spacer, the first sealing surface, and the second sealing surface form and maintain a wafer cavity containing the region for holding the semiconductor substrate during high pressure processing.

Claim 2 (original): The high pressure chamber of claim 1 wherein the first sealing surface of the chamber housing comprises an o-ring groove.

Claim 3 (original): The high pressure chamber of claim 2 further comprising an o-ring within the o-ring groove.

Claim 4 (original): The high pressure chamber of claim 1 wherein the second sealing surface of the platen comprises an o-ring groove.

Claim 5 (original): The high pressure chamber of claim 4 further comprising an o-ring within the o-ring groove.

Claim 6 (canceled)

Claim 7 (previously presented): The high pressure chamber of claim 1 wherein the single mechanical drive mechanism comprises a piston driven by a fluid.

Claim 8 (original): The high pressure chamber of claim 7 wherein the fluid comprises an incompressible fluid.

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Claim 9 (original): The high pressure chamber of claim 7 wherein the fluid comprises a compressible fluid.

Claim 10 (previously presented): The high pressure chamber of claim 1 wherein the single mechanical drive mechanism comprises an electro-mechanical drive mechanism.

Claim 11 (previously presented): The high pressure chamber of claim 10 wherein the electro-mechanical drive mechanism comprises a linear actuator.

Claim 12 (original): The high pressure chamber of claim 11 wherein the linear actuator comprises a drive screw.

Claim 13 (currently amended): A high pressure chamber for processing a semiconductor substrate comprising:

- a. a chamber housing comprising a first sealing surface;
- b. a spacer containing a plurality of injection nozzles, the spacer configured to seal to the first sealing surface;
- c. a platen comprising a second sealing surface and a region for holding the semiconductor substrate;
- d. a single mechanical drive mechanism having a single pressure source, the single mechanical drive mechanism coupling the platen to the chamber housing such that in operation the single mechanical drive mechanism separates the second sealing surface from the spacer for loading the semiconductor substrate and further such that in operation the said single mechanical drive mechanism causes the second sealing surface of the platen to seal to the spacer, such that the spacer, the first sealing surface, and the second sealing surface form a wafer cavity containing the region for holding the semiconductor substrate; and
- e. a mechanical clamp coupled to the chamber housing and the platen such that in operation the mechanical clamp maintains the wafer cavity during high pressure processing.

Claim 14 (canceled)

Claim 15 (currently amended): An apparatus for high pressure processing of a semiconductor substrate comprising:

- a. a pressure chamber frame;
- b. a single piston coupled to the pressure chamber frame and comprising a piston body and a piston neck, the pressure chamber frame and the piston body forming a first fluid cavity;

- c. a sealing plate coupled to the pressure chamber frame, the sealing plate in conjunction with the pressure chamber frame, the piston body, and the piston neck forming a second fluid cavity;
- d. a platen coupled to the piston neck, the platen comprising a region for holding the semiconductor substrate and a first sealing surface;
- e. a spacer having a plurality of injection nozzles configured to couple to a supply source; and
- f. a top lid coupled to the pressure chamber frame and comprising a second sealing surface, the second sealing surface sealing to the spacer, the first sealing surface of the platen and the spacer configured such that in operation the said piston body can be moved using a single pressure within the first fluid cavity so that the first sealing surface seals to the spacer to form a wafer cavity and to maintain the wafer cavity during high pressure processing, and in further operation the piston body can be moved so that the first sealing surface is separated from the spacer, thereby allowing the semiconductor substrate to be loaded into and unloaded from the pressure chamber frame.

Claim 16 (previously presented): The apparatus of claim 15 wherein the first sealing surface and the second sealing surface are configured to form the wafer cavity and to maintain the wafer cavity with a supercritical environment therein.

Claim 17 (previously presented): The apparatus of claim 15 wherein the first sealing surface and the second sealing surface are configured to form the wafer cavity and to maintain the wafer cavity with a non-supercritical environment therein.

Claim 18 (canceled)

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Claim 19 (currently amended): The high pressure chamber of claim 1, wherein the spacer further contains a plenum coupled to the plurality of injection nozzles, the plenum having a width larger than a width of the plurality of injection nozzles.

Claim 20 (previously presented): The high pressure processing chamber of claim 19, wherein a ratio of the width of the plenum to the width of the plurality of injection nozzles is at least 3:1.

Claim 21 (currently amended): The high pressure processing chamber of claim 19, further comprising a supercritical condition generator coupled to the plenum, the supercritical condition generator comprising a heater coupled to a supply source, the supply source comprising a supply vessel.

Claim 22 (currently amended): The high pressure chamber of claim 1, further comprising a circulation loop coupled to the wafer cavity and configured to maintain a supercritical fluid in a supercritical state and to circulate the supercritical fluid through the wafer cavity wherein the high pressure processing chamber, further comprising a pump and a filter coupled to the circulation loop.

REASONS FOR ALLOWANCE

2. The following is an examiner's statement of reasons for allowance:

The newly added limitation of injection nozzles coupled to supply fluid to processing cavity and being contained in a spacer used to seal to both the platen and the chamber housing is not disclosed or fairly suggested in the prior art in the context of independent claims 1, 13 and 15.

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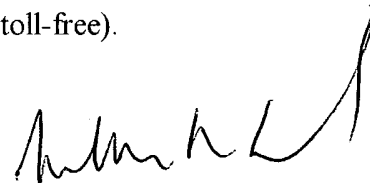
Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ram N Kackar whose telephone number is 571 272 1436. The examiner can normally be reached on M-F 8:00 A.M to 5:P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on 571 272 1439. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

RK



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PRIMARY EXAMINER